Vol. 4 No. 4. June, 1945

ANNALS OF THE RHEUMATIC DISEASES

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CONTENTS

PAGE

Gold Treatment in Rheumatoid Arthritis. THOMAS N. FRASER 71

Effect of Penicillin on Rheumatoid Arthritis. EDWARD W. BOLAND, NATHAN E. HEADLEY AND PHILIP S. HENCH 76

Investigation into the Aetiology and Pathology of Fibrositis of the Back. W. H. MYLECHREEST 77

Some Orthopaedic Aspects of Rheumatic Disease. A. G. TIMBRELL FISHER 80

Rheumatic Fever in Malta: A Clinical Note. R. E. TUNBRIDGE AND W. S. C. COPEMAN ... 85

LONDON
BRITISH MEDICAL ASSOCIATION
TAVISTOCK SQUARE, W.C.1

YEARLY SUBSCRIPTION (4 NUMBERS) 25/- U.S.A. $6.00 SINGLE NUMBER 7/6

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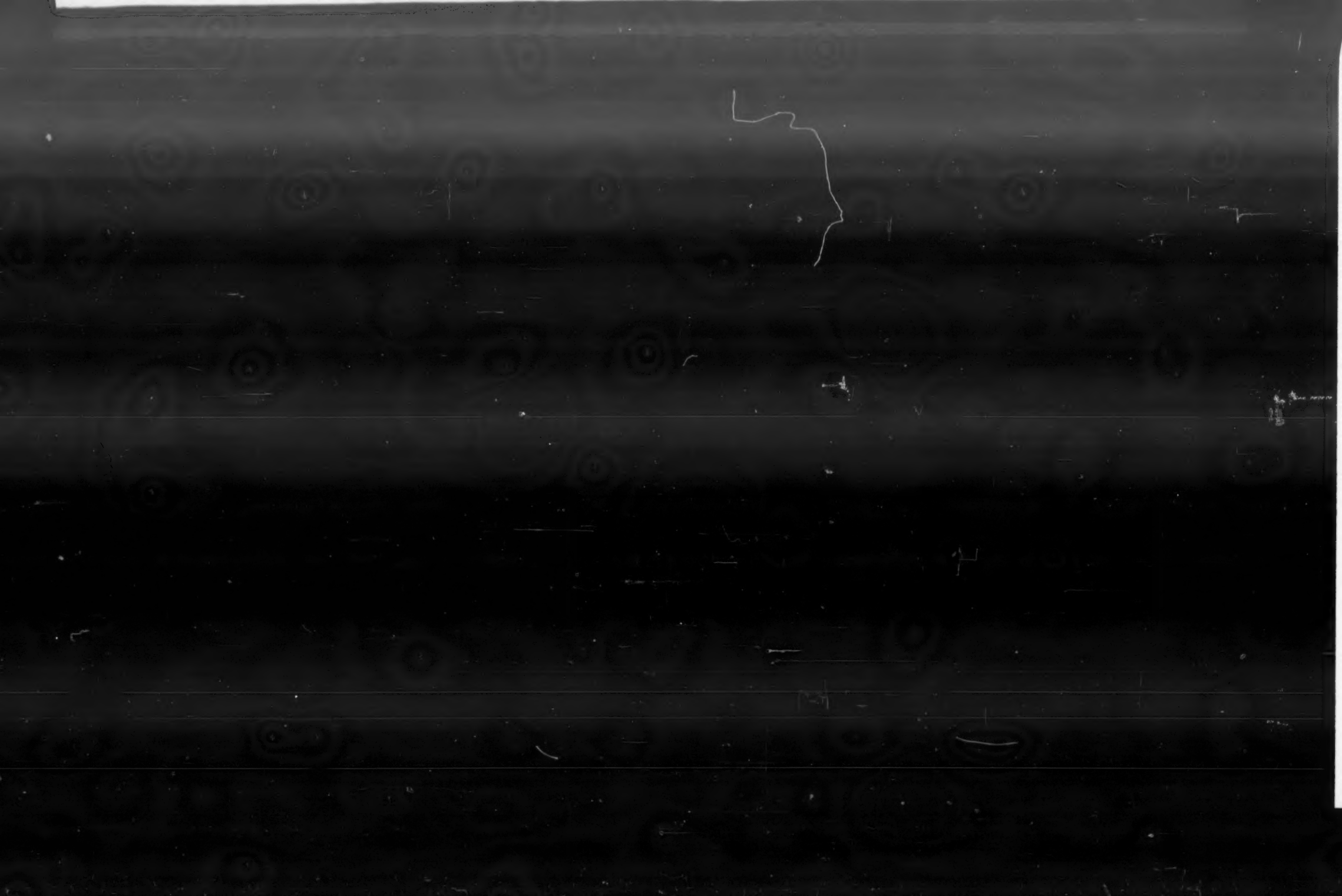

GOLD TREATMENT IN RHEUMATOID ARTHRITIS

BY

THOMAS N. FRASER

Glasgow

This investigation was undertaken for the Empire Rheumatism Council as part of a wider scheme to assess the value of gold salts in the treatment of rheumatoid arthritis. It was originally planned that the work should be carried out at various centres throughout the country, but unfortunately the war intervened and the main scheme had to be abandoned. It was found possible, however, to carry on with the experiment on a smaller scale at the Gardiner Institute of Medicine. The investigation was concentrated on classical cases of rheumatoid arthritis in which clinical activity was known to have been present for two to five years. In addition, women should have shown the first signs of the disease before the age of 40 and men before the age of 50. The period of observation extended over one year.

Gold therapy has been in use for a number of years, and, on the whole, the published results have been favourable. It should be pointed out, however, that in few instances has any attempt been made to control these observations, especially the psychological aspects of the treatment, in large clinics. One of the chief aims in this investigation was to neutralize the psychological effect usually associated with "having an injection." With this in view the patients were divided roughly into two equal groups, one receiving injections of myocrisin and the other an inactive control substance, identical in appearance with the gold salt and provided by the makers in similar phials. It was not made known to me which patients had received the former and which the latter until after I had completed and recorded my final observations. In this way an attempt was made to control the investigation adequately, and the results are embodied in this paper.

Historical

In 1890 Koch stated that gold cyanide in dilutions of 1 : 2,000,000 inhibited the *in vitro* growth of the tubercle bacillus; since then many therapeutic trials have been carried out with gold salts. Junker (1913) gave gold cyanide intravenously to eleven patients with pulmonary tuberculosis, and stated that his general impression of the results was not unfavourable. Feldt (1917) introduced a complex organic compound of gold—krysolgan—which he used in experimental animal infections with tuberculosis. It was not until 1924, however, that gold salts became recognized as a useful therapeutic agent, when Möllgaard used sanocrysin in the treatment of pulmonary tuberculosis and reported favourable results.

After the encouraging reports of the use of sanocrysin in tuberculosis, its effect was tried in other conditions. In 1926 Feldt introduced another new gold compound—solganal—which was used by Lewy and Freund (1926) with good results in streptococcal infections in man. Schmidt (1944) claimed that nearly twenty years ago he was among the first to employ gold in the treatment of the various types of arthritis and found that it had a very limited usefulness. In Stockholm, Hedenius (1926) reported good results with the use of colloidal gold in septic polyarthritis, and Landé (1927) was favourably impressed with solganal in the treatment of chronic polyarthritis. Pick (1927), however, using triphal, found little or no improvement in his small series of patients. The use of gold salts in rheumatoid arthritis spread rapidly throughout Europe, and almost simultaneously Forestier (1929) in France, and Umber (1929), Zimmer (1930), and Feldt (1930) in Germany published independent results of chrysotherapy in this disease. Forestier stated that his attention was drawn to the use of gold salts in the treatment of some of the forms of chronic arthritis by the analogy of the clinical evolution of certain severe types of chronic rheumatism with that of tuberculosis; he (Forestier, 1935) reported that 70–80% of over 550 patients responded favourably to gold therapy.

In this country reports on the treatment of rheumatoid arthritis with gold salts began to appear in 1934. Slot and Deville (1934) and Buckley (1934) used gold salts in two small series of cases with promising results. The latter felt that there was no greater risk with gold salts than with protein shock. The following year Pemberton (1935) published encouraging results in a series of 100 patients with varying types of chronic arthritis, and concluded that the response to gold salts was roughly inversely proportional to the duration of the disease. In subsequent years an increasing number of publications on this subject made their appearance. Crosby (1936), Bach (1936), Crawford (1937), Copeman and Tegner (1937), Hartfall *et al.* (1937), and Ellman *et al.* (1940) made valuable contributions to

the literature. The most outstanding of these were the results of Hartfall and his co-workers at Leeds, who claimed that 80% of 750 patients with rheumatoid arthritis showed apparent cure or striking improvement.

In America gold therapy was not looked on with any great favour for a number of years. Philips (1936) used gold salts in 9 cases, but gave it up as he felt that, on account of its toxicity, he was " not competent to handle the drug to the advantage of the patient." In the same year, however, Oren (1936) found that 91% of 66 patients were improved. In more recent years many contributions on the subject have appeared, including favourable reports by Key *et al.* (1939), Snyder *et al.* (1939), Sashin *et al.* (1939), Dawson *et al.* (1941), and Cecil *et al.* (1942). Snyder and his associates felt that they obtained better results in older patients, a view that is at variance with other reports. Cecil and his colleagues found that relapses, usually milder than the original attack, were quite common in their series of 245 cases. Other work on gold therapy has been done by Secher aud Gudiksen (1935), Parr and Shipton (1937), Sundelin (1941), and Graham and Fletcher (1943). Sundelin, in an excellent monograph from Scandinavia, gives a detailed account of the literature on gold therapy, and reports the results of 730 cases of chronic inflammatory arthritis treated with a variety of gold preparations, some of the patients receiving as many as five courses of injections. He is very cautious in assessing his results, but he felt that 93% of the patients showed improvement although it was marked in less than half of these.

To sum up, the majority of observers have been favourably impressed with the use of gold salts in rheumatoid arthritis, and most have found that 70–80% of their patients respond well to this treatment.

Clinical Material

Age and Sex.—Of the 110 patients falling into the category described, 28 were males and 82 females —a ratio of approximately 1 : 3. Table 1 shows the patients in different age-groups at the onset of arthritis, but it should be remembered that no women over the age of 39 were included. It will be seen that more than half of the patients in this series fall into the age-group 30–39.

TABLE 1

Age-group	Age-distribution at onset of arthritis. No. of cases
0–9	0
10–19	10
20–29	29
30–39	59
40–49 (males only)	12
Total	110

Previous Health.—Forty-nine of the patients had a history of rheumatic fever, scarlet fever, or tonsillitis. Of these, 11 were known to have had rheumatic fever. Three patients were suffering from psoriasis, and this had been present before the onset of the arthritis.

Family History.—Fifty-eight (53%) of the patients stated that there was some form of " rheumatism " in the family, and, of these, 28 (25%) had blood relations with rheumatoid arthritis.

Joint Involvement.—Bilateral and symmetrical involvement of the finger-joints was present in all the patients in the series.

Cardiac Involvement.—Valvular disease of the heart was present in 15 (14%) of the patients, and high blood-pressure in 2.

Previous Treatment.—The majority of the patients had already had some form of treatment—e.g. eradication of septic foci, protein shock, salicylates, physiotherapy—with little or no improvement. None had been treated with gold salts.

Method of Treatment

All the patients, with one exception, had ambulatory treatment, and attended the clinic once a week for observation and injections. In addition, all received some form of physiotherapy, such as heat and massage. Before treatment was begun each patient was given a thorough clinical examination, including joint measurements, full blood count, blood sedimentation rate, blood uric acid, urine analysis, urea clearance, and radiological examination; the findings were charted on special case sheets. The same procedure was adopted at the end of the period of observation—i.e. one year—while during treatment weekly urine analysis, fortnightly white-blood-cell counts, and monthly blood sedimentation tests were carried out. A careful watch was kept for the first signs of intolerance to gold.

As already mentioned, roughly half the patients received myocrisin, an aqueous solution of gold sodium thiomalate containing 50% metallic gold; and half an inactive control substance. The latter contained the same constituents as the myocrisin with the exception of the gold radical, had the same appearance, and was made up in identical ampoules. As previously stated, it was not made known to me which patients had received myocrisin and which the inactive control substance until after I had completed and recorded my final observations on the progress of the disease. Both the myocrisin and the control substance were administered in the same way. Intramuscular injections were given into the buttocks at weekly intervals in the following doses: $1 \times 0{\cdot}01$, $2 \times 0{\cdot}02$, $1 \times 0{\cdot}05$, and $9 \times 0{\cdot}1$ g., giving a total of 1·0 g. in a course. If necessary, after an interval of three months a second course of 1·0 g. was given in the same dosage. As the period of observation was for one year only, it was not possible to give more than two courses of injections. Treatment was suspended temporarily when the milder forms of toxicity appeared, and permanently when the reactions were severe.

Results of Treatment

Of the 110 patients 61 had injections of myocrisin and 49 the inactive control substance. Owing to toxic reactions or to the patient's defaulting, 4

of the former and 3 of the latter are not included in the results of treatment. Thirteen of the patients on myocrisin and 28 on the control received two courses of injections, while the remainder received only one or part of one course.

It is difficult to decide what criteria to use in assessing the results of treatment. I have based the classification on my general impression of the progress made and on the change in the clinical signs—e.g. general condition, gain in weight, joint swelling, restoration of function, blood sedimentation rate, etc. The patients were divided arbitrarily into five groups : great, moderate, slight, and no improvement, and worse. No cures were claimed, as it is apparent that the patients were not observed over a sufficient period of time. The results of myocrisin are shown in Table 2 and of the inactive control substance in Table 3; the figures in parentheses in both representing the results as obtained from questioning the patient about his own opinion as to progress during the year.

TABLE 2

RESULTS OF TREATMENT WITH MYOCRISIN

Result	Cases	
	Number	%
Great imp.	24 (32)	42 (56)
Moderate imp.	12 (8)	21 (14)
Slight imp.	11 (6)	19 (11)
No imp.	5 (9)	9 (16)
Worse.	5 (2)	9 (3)
Total	57	100

TABLE 3

RESULTS OF TREATMENT WITH INACTIVE CONTROL SUBSTANCE

Result	Cases	
	Number	%
Great imp.	4 (15)	8 (33)
Moderate imp.	6 (12)	13 (26)
Slight imp.	11 (6)	24 (13)
No imp.	10 (6)	22 (13)
Worse.	15 (7)	33 (15)
Total	46	100

From these figures it will be seen that, while 82% of the patients who received myocrisin improved clinically, 45% of those on the control also showed some improvement. However, a closer study of the results shows that there is a considerable difference in the degree of improvement in the two groups. It is of interest to note that 72% of the control group felt that they had received some benefit from the injections, although only 45% showed clinical improvement.

Graham and Fletcher (1943) pointed out that a good result following on gold therapy was related to a fall in the blood sedimentation rate—the better the clinical result, the greater the fall. An analysis of the clinical results in relation to the sedimentation rate in both groups in this series is shown in Table 4.

TABLE 4

RELATION OF IMPROVEMENT TO FALL IN BLOOD SEDIMENTATION RATE

Result	Sedimentation rate			
	Myocrisin		Control	
	Average initial	Average final	Average initial	Average final
Great imp... ..	23	7	47	11
Moderate imp. ..	20	9	27	17
Slight imp... ..	26	13	11	14
No imp.	10	9	22	17
Worse.	15	7	19	31

Of the 57 patients who received myocrisin 19 were unable to continue with their work when first seen, while of the 46 patients on the control substance 14 were similarly incapacitated. By the end of the period of observation 17 of the former and 4 of the latter had been able to resume their employment.

Blood uric acid estimations (Benedict, 1922) were carried out before and after treatment in all the patients in this series. Out of the 110 patients 12 had initial levels above the normal (2–4 mg./100 c.cm.), the highest being 6·0 mg. Of these, 7 received myocrisin and 5 the inactive control substance. The final levels were within normal limits in 11 of the 12 cases, and in the twelfth the blood uric acid fell from 6·0 mg. to 4·4 mg. after one course of myocrisin.

Toxic Reactions

It is a well recognized fact that the use of gold salts in the treatment of rheumatoid arthritis is not without its dangers. The incidence of toxic reactions is high, according to many observers appearing in about half the cases. The majority of reactions are of a mild nature, but fatalities have been recorded from time to time (Forestier, 1935, Ellman and Lawrence, 1935; Hartfall and Garland, 1935 and 1936). These were usually associated with the larger dosages that were given in the earlier days of gold therapy. In the present series 75% of the 61 patients who received gold injections developed toxic manifestations (Table 5)—a figure higher than that generally reported—but the majority of these were mild. Seven patients had multiple reactions. Most of the reactions occurred during the first course of injections, but some appeared in the second course, and a few were delayed, making their appearance some time after the cessation of treatment. It is of interest to note that 37% of the 49 patients who were given the control substance had " toxic reactions " (Table 6).

TABLE 5

TOXIC REACTIONS FOLLOWING THE USE OF MYOCRISIN IN 61 CASES OF R.A.

	No. of cases
Skin (minor reaction)	35
Mouth	7
Kidney	5
General	4
Skin (major reaction)	2
Alimentary tract..	1
Total	54 (75%)

TABLE 6

"TOXIC REACTIONS" FOLLOWING THE USE OF AN INACTIVE CONTROL SUBSTANCE IN 49 CASES OF R.A.

	No. of cases
Skin	16
Kidney	2
Mouth	1
Total	19 (37%)

General Reactions.—These were noted in 4 of the patients who received myocrisin, and consisted of headache and shivering immediately after each injection.

Skin Reactions.—These appeared in 37 of the 61 patients who received myocrisin injections, but only 2 were of a severe nature and gave rise to some anxiety. Both of these patients were admitted to hospital for a period of six weeks, but it was several months before the skin had returned to its normal condition. The remaining 35 patients had reactions of a minor character, 7 of them having pruritus only. Other skin lesions were simple erythema, macular, maculo-papular, papular, pustular, squamous, and exudative dermatitis. Some of these were accompanied by fissuring of the palms of the hands, and others by desquamation of the skin. Treatment was discontinued only temporarily in most of these cases. There were several cases of delayed reactions; in one instance a patchy exudative dermatitis appeared three months after the cessation of gold therapy. Sixteen of the 49 patients who received the inactive control substance complained of skin lesions. Of these, 10 had pruritus only; 2 a papular dermatitis; and the other 4 an erythema, a pustular rash, a seborrhoeic dermatitis, and a dermatitis infectiosa respectively. It should be pointed out that all the patients were made "skin conscious" before treatment started, and were instructed to report anything out of the usual.

Mouth Lesions.—These were noticed in 7 patients who had myocrisin injections. Four of these had ulceration of the lips, cheeks, and gums, and 3 complained of soreness of the mouth without any lesions. One of the patients on the control substance stated that she had a metallic taste in her mouth during treatment.

Kidney.—A mild transient albuminuria appeared in about half of the patients in both the myocrisin and the control groups, but was not considered of sufficient importance to be included in the kidney reactions. Only 5 of the patients who received myocrisin showed any definite evidence of kidney damage. Albumin, red blood cells and casts were found in the urine and treatment was abandoned. Two of the control patients also developed albumin and casts in the urine. The urea clearance test (McIntosh *et al.*, 1928) was performed on all the patients in both groups in this series before and after each course of injections, but the results did not show anything of significance even in those cases in which blood and casts were found in the urine.

Alimentary Tract.—One patient developed a colitis with blood and mucus in the stools after receiving 0·6 g. of myocrisin. This proved very resistant to treatment, and, when seen recently, 17 months after the onset, the patient stated that although the condition was much better he still had periodic attacks of diarrhœa without blood or mucus.

Blood.—A decrease in the white cell count was noticed during treatment in the majority of patients receiving myocrisin, but in no instance did it fall below 3,000 per c.mm. The count returned to its original level shortly after the end of treatment. It was noticeable that the haemoglobin generally rose in those patients who responded to gold therapy.

It has been the experience of most observers that those patients who develop toxic reactions generally have a marked alleviation of the joint condition. This was found to be true in the present series, especially with the more severe reactions—*e.g.* exfoliative dermatitis and colitis.

Discussion

Although the number of patients in this series is small and the period of observation for the purposes of the investigation—i.e. one year—is short, it is justifiable to draw certain conclusions. It should be borne in mind, however, that treatment was confined to one small group of patients suffering from rheumatoid arthritis. In the first instance the patients had had the condition for 2–5 years. This choice was made in an attempt to eliminate so far as possible the inclusion of patients showing spontaneous remissions, which are most common during the first two years of the disease, and to exclude old-standing cases in which the disease might have burned itself out. Secondly, men should have shown the first signs of the disease before the age of 50, and women before the age of 40. In this way it was thought to avoid any complicating factor associated with the menopause. Thirdly, every patient had some form of physiotherapy, such as heat and massage. Lastly, I wish to stress again one important point—namely, that I was completely unaware of what each patient was receiving during his course of injections.

Of the 57 patients who received myocrisin 82% showed clinical signs of improvement compared with 45% of the 46 patients on the control substance. At first sight these figures do not seem very encouraging, as there is only a 37% difference in favour of the myocrisin; but on going into the results more closely (Tables 2 and 3) it is found that, whereas 42% of the former showed great improvement, only 8% of the latter improved to this extent. Similarly, 21% of these on myocrisin were moderately improved as against 13% of the controls. Slight improvement was noted in 19% of the myocrisin cases and 24% of the controls; and, finally, in 18% of the former and 55% of the latter the condition remained stationary or deteriorated.

Why should the control patients have shown any improvement? The explanation probably lies in the fact that all the patients received some form of physiotherapy, and, secondly, that spontaneous remission must have occurred in a number of cases. In the same way it would be reasonable to suggest

that these two factors were responsible for the improvement shown in roughly the same percentage of cases in the myocrisin group. If this were so, the figures showing improvement as the result of gold therapy would be appreciably reduced—viz., to 34% great improvement and 8% moderate improvement. It should be explained, however, that only 13 of the 57 patients had more than one course of gold injections, and that, while the condition of many of those receiving only one course improved considerably during the treatment, it had regressed by the end of the period of observation. It was unfortunate that war work prevented many from attending for further therapy.

I have already drawn attention to the fact that 72% of the patients who received the inactive control substance improved subjectively, although only 45% showed objective (clinical) improvement. This finding suggests that a psychological factor is present and must be borne in mind, more particularly when the patient's statements as to progress are used as one of the criteria in assessing results.

From my results it is fair to assume that the good results claimed for gold therapy in rheumatoid arthritis by the majority of observers are unjustifiably high owing to lack of adequate controls. Likewise, the same criticism will apply to other forms of treatment in this condition, and, indeed, in all diseases. Great caution should therefore be observed in assessing the results of any form of therapy, and extravagant claims for any new drug should be avoided unless the investigation has been properly controlled.

In conclusion, in my view gold therapy is the best single form of treatment in rheumatoid arthritis that we have at our disposal at the present time, and that its results are enhanced when used in conjunction with general, physiotherapeutic and orthopaedic measures. It is by no means a panacea and its limitations should be kept in mind. It may well be that the relief obtained is only of a temporary nature, and a review of the cases after a period of at least five years is essential before any final pronouncement is made on the lasting effects of gold therapy. Reports in the literature of follow-ups are conspicuous by their absence. Moreover, gold is a dangerous drug, and toxic reactions have been reported by some authorities in over 50% of their patients. For this reason I feel that gold salts should be given only by those who have had experience in their use and are fully aware of the dangers.

Summary

1. Of 103 cases of rheumatoid arthritis who were observed over a period of one year, 57 received injections of myocrisin and 46 an inactive control substance. At the time it was not known to the observer what each patient received.

2. Some clinical improvement was observed in 82% of the patients on myocrisin and in 45% of those on the control, but the degree of improvement was more marked in the former group.

3. In assessing any form of treatment it is essential that the investigation should be adequately controlled, especially from the psychological aspect.

4. Toxic reactions occurred in 75% of the patients who received myocrisin, but most of these were of a mild nature. There were no deaths in this series, and only two patients, with exfoliative dermatitis, gave rise to some degree of anxiety.

5. Gold salts are of value in the treatment of rheumatoid arthritis, particularly when used in conjunction with general, physiotherapeutic, and orthopaedic measures. On account of their toxicity they should only be employed by those with experience in their use.

I wish to thank the Empire Rheumatism Council for a Personal Grant extending over two years, and Messrs. May and Baker, Ltd., for presenting ample supplies of myocrisin and the inactive control substance.

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THE EFFECT OF PENICILLIN ON RHEUMATOID ARTHRITIS *

BY

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The cause of rheumatoid (atrophic) arthritis is unknown. Of the many aetiological theories the microbic hypothesis is still the most widely accepted, and of the many different bacteria which have been incriminated, haemolytic streptococci have been, since 1929, most under suspicion. Haemolytic streptococci from time to time have been recovered from the synovial fluid and blood, from foci of infection, and occasionally from synovial membrane, blood, and lymph nodes of patients with rheumatoid arthritis. The blood of the majority of patients who have this disease contains antibodies against haemolytic streptococci—that is, agglutinins, generally in high titre, and precipitins for the C substance of haemolytic streptococci. Although the concentration of antistreptolysins and antifibrolysins in the blood is not increased, except in some early or acute cases, the skin of patients with rheumatoid arthritis often is found to be hypersensitive to extracts of haemolytic streptococci. Such is the direct and indirect evidence on which the argument against haemolytic streptococci has been based. But since many patients with unmistakable rheumatoid arthritis do not present such evidence, the hypothesis has been presumptive only.

Ever since it was announced that penicillin was extremely effective against a variety of infectious agents, including haemolytic streptococci, many physicians and a host of rheumatic patients have been hopefully awaiting news that penicillin might prove effective against rheumatoid arthritis, although the sulfonamides, also effective against haemolytic streptococci, have proved useless against this disease. Hence this investigation.

Plan of Investigation

Two chief policies governed our investigation.

1. *Policy Regarding Selection of Cases.*—The only cases chosen for trial of treatment with penicillin were those in which the disease had advanced far enough to be diagnostically unmistakable but not far enough to have produced irreversible changes (destruction of cartilage and subchondral bone, notable flexion deformities), the presence of which might have made difficult a clear-cut evaluation of results.

2. *Policy Regarding Dosage.*—We decided to give penicillin long enough and in large enough doses so that, were our results negative, it could not well be said that our patients had not received sufficient amounts of the material. Ten patients have been treated intensively; all were male soldiers recently on active duty; their ages were from 23 to 45. The average duration of the disease was 7·4 months. The sedimentation rates varied from 21 to 55 (Wintrobe).

Summary of the Results

1. Penicillin was given to ten soliders with early but progressive rheumatoid arthritis.

2. Large doses of penicillin were given intramuscularly every three hours day and night. The daily doses of penicillin were from 120,000 to 320,000 Oxford units; total doses were from 1,800,000 to 3,250,000 units within fourteen to twenty days. Such large doses are known to be adequate—indeed, perhaps more than adequate—against even severe infections (with or without bacteriaemia) from haemolytic streptococci, staphylococcus aureus, and so forth.

3. Our clinical results from penicillin, given in the doses stated over a period of fourteen to twenty-one days, were essentially negative. In 7 of the 10 cases there was no significant subjective or objective improvement. One patient felt worse but did not appear to be in worse condition than before treatment. In one case there was slight subjective, but no objective, improvement. One patient experienced moderate objective and subjective improvement in some, but not in all, of his joints; the sedimentation rate increased slightly during treatment, and he was by no means cured or even decidedly improved. In view of the capricious nature of rheumatoid arthritis the improvement in these two cases must be regarded as unrelated to the penicillin.

4. There was no definite evidence of improvement as measured by laboratory tests. There was no significant improvement in sedimentation rates or in the comparative leucocyte counts on synovial fluid made before and after treatment.

5. Definite improvement in appetite was noted by 6 of the 10 patients. It may have been unrelated to treatment with penicillin or it may have been a general side effect thereof.

Conclusions

1. Our results offer no support to the idea that haemolytic streptococci may be aetiologically related to rheumatoid arthritis.

2. In view of these negative results with rather large doses of penicillin, it seems reasonable to assume that rheumatoid arthritis is not caused by any of the bacteria which are already known to be rapidly affected by penicillin.

3. From these negative results we would conclude that penicillin probably should not be used for the further clinical treatment of rheumatoid arthritis, at least until the material is available in something approaching inexhaustible quantities.

* Abridged from a paper in the *Journal of the American Medical Association* (1944, 126, 820–823), by courtesy of the Editor.

AN INVESTIGATION INTO THE AETIOLOGY AND PATHOLOGY OF FIBROSITIS OF THE BACK *

BY

W. H. MYLECHREEST

The aetiology and pathology of fibrositis of the back are still unknown, and this investigation was started in the hope of clarifying the picture. It was therefore decided to examine the backs of all bodies reaching the post-mortem table to establish the normal condition before studying any " fibrositic " nodules that might subsequently be available for examination. Twleve backs were dissected. The results set out below appear to have a bearing on the aetiology and pathology of fibrositis of the back.

The twelve backs examined were those of the first twelve bodies which came to post-mortem examination after it had been decided to carry out this investigation. They included, besides cases of long-standing illness and consequently much wasting, several cases of sudden death. As the findings were constant in all twelve bodies they may be regarded as normal and not the result of wasting or the processes of disease. The important part that fatty tissue might play in the disease became apparent after examination of the first few backs. Additional evidence was provided by the clinical experience recorded by W. S. C. Copeman and W. L. Ackerman (1944), who gave me the opportunity to see their cases and to study biopsy material.

Some Definitions

For the purpose of description it was decided to divide the back into three zones: (1) from the neck down to the lower costal margin; (2) from the lower costal margin to the iliac crest; (3) the buttocks. The most striking feature of these dissections was the distribution of fatty tissue apart from the subcutaneous fat. This was constant in all the bodies, and inasmuch as many of them had little or no subcutaneous fat may be called the " basic fat." Before describing the distribution of this fat it is necessary to describe the fascia of the back. The commonly accepted definition of the superficial fascia is " that areolar tissue which lies immediately beneath the skin." This tissue extends over the entire surface of the body and contains a variable amount of fatty tissue, but, to quote *Gray's Anatomy* (27th edition, p. 523), " beneath the fatty layer there is generally another layer of superficial fascia, almost devoid of adipose tissue." Furthermore this fascia varies in thickness in different parts of the body—e.g. Scarpa's fascia and Colles' fascia. In the back, too, it consists not only of one layer but of many layers and compartments, and it is in this fascia that the " basic fat " is found. The term superficial fascia will therefore in this article be restricted to this second or deeper superficial fascia. Deep to this superficial fascia is the deep lumbar fascia, which consists of three layers—posterior, middle, and anterior. The posterior and middle layers unite at the edge of M. Sacrospinalis to form a sheath for the muscle. The fat enclosed in the angle thus formed plays an important part in " fibrositis " of the back, as will be apparent later.

To save needless repetition all the constant findings have been included in one composite description and isolated findings of importance described separately.

Zone 1

It was noted that the superficial fascia in the region of the shoulder gets thicker as it ascends to the top of M. Deltoideus, and there are deposits of yellow fat in the upper and posterior aspects of the joint. This fat, which presumably protects the joint, tends to lie deep to the fascia and to run into the intermuscular septa. The superficial fascia thickens into a stout band superficial to the posterior aspect of the acromion and the superior border of the scapula. Fatty tissue is also to be found along these areas. This fascia is very tough and adherent to the skin in this zone, except between the scapulae. A thick fibrous fascia (deep fascia) was found over M. Infraspinatus, with fibres just visible to the naked eye running downwards and outwards. It was attached firmly to the medial border of the scapula and to the scapular spine, and forms a capsule for the muscle. Some fat was found along the spine, deep to this fascial attachment. At the anterior border of M. Trapezius it was seen that the fascia split to enclose the muscle, and in the angle thus formed by the two layers of fascia there was some fatty tissue.

The fat in Zone 1 is almost entirely yellow in colour, in striking contrast to that in Zone 2. It is mostly deep to the superficial fascia and is found chiefly on the inner side of the scapula and the point of the shoulder. There is also yellow and pink fat lying in the sheaths of the tendinous portions of the erector spinae muscles deep to the trapezius and rhomboids. There is also another area of fat in the midline extending from the level of the 5th cervical

* This article is based on a thesis for the M.D. of Cambridge University.

vertebra to the 3rd thoracic: this fat lies on and in the superficial fascia.

Zone 2

The superficial fascia in this zone is very vascular: fine hairlike vessels, which in the main run downwards and outwards, can be seen quite clearly. The skin is more adherent in this zone, except towards the sides of the body. The most striking feature is the fat, which is reddish in colour and constitutes the major portion of the basic fat. It is found to be in, rather than on, the superficial fascia; this consists of many layers or compartments in which the fatty tissue is contained. Its extent is as follows:

Medially.—The outer border of M. Sacrospinalis.

Laterally.—It is small in extent near its upper border, and expands laterally as it reaches the iliac crest, until its outer limit is some 2½ inches lateral to the outer border of M. Sacrospinalis.

Above.—The upper limit is approximately the level of the third lumbar vertebra.

Below.—It descends into Zone 3 for some 2 inches below the iliac crest and there covers that part of M. Gluteus medius which is not covered by M. Gluteus maximum. In addition to this fat there is also fat in the angle formed by the posterior and middle layers of the deep lumbar fascia where they unite to enclose M. sacrospinalis. This fat extends up to the point where M. Sacrospinalis is crossed by the lower border of M. Latissimus dorsi, presumably protecting the nerves and blood vessels which perforate this fascia where they are not covered by the latter muscle.

Zone 3

The red fat in Zone 2 extends into this zone as described above: the rest of the fatty tissue here is yellow fat and is considerable in amount; it lies in and deep to the superficial fascia.

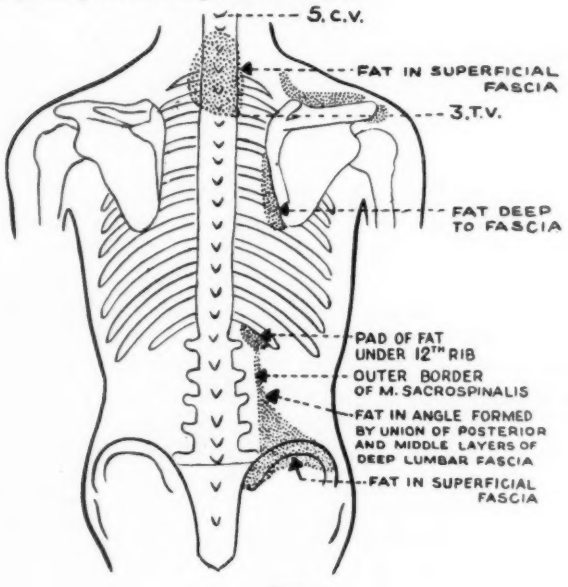
S.C.V.
FAT IN SUPERFICIAL FASCIA
3.T.V.
FAT DEEP TO FASCIA
PAD OF FAT UNDER 12TH RIB
OUTER BORDER OF M. SACROSPINALIS
FAT IN ANGLE FORMED BY UNION OF POSTERIOR AND MIDDLE LAYERS OF DEEP LUMBAR FASCIA
FAT IN SUPERFICIAL FASCIA

FIG. 1.

Herniation of Fat

In the fourth body dissected a herniation of fat from one layer of fascia to another was found, and many examples of this were observed in subsequent dissections. They were even brought on by pressure on either side of a weak spot in the fascia, and it seems clear that the pressure of a suddenly contracting muscle with the counter-pressure of underlying bone could easily produce and maintain herniation of fat lobules. The presence of these herniae and gaps in the fascia where herniation could easily occur suggests many possibilities. In twelve biopsies on selected patients suffering from clinical "fibrositis" of the back fatty lobules under tension or fatty herniae were discovered. Their removal resulted in cure in most cases and striking relief in those not completely cured. The presence of fat in the angle formed by the union of the posterior and middle layers of the deep lumbar fascia has been described; the posterior primary nerve roots pierce this fascia and are surrounded by fatty tissue. Congestion or oedema of this fat could obviously give rise to severe pain, and, furthermore, the edges of the ring of fascial opening might maintain these swollen lobules for a long time, resulting in permanent pathological change.

Herniae of fat may be divided into two broad groups: (1) *Congenital*.—Where a mass of fat passes through one or more layers of fascia through well-defined gaps; this was found many times in the course of the dissections. (2) *Acquired*.—This group can be further sub-divided into (*a*) mechanical, and (*b*) postural—e.g. lying in bed during long illness.

The mere presence of herniation will not by itself necessarily give rise to symptoms, and the probable sequence of events in those cases that do develop clinical "fibrositis" of the back is as follows. If herniation takes place by mechanical means—e.g. during violent physical exercise or unexpected contraction of certain muscles—the result will be (1) constriction of the blood vessels, leading to (2) oedema or haemorrhage in the fatty tissue: examination of sections of fatty nodules removed at biopsy confirm these views. This was clearly shown, in at least two patients, as one dated the onset of pain from an accident when playing rugby football, and another after throwing heavy cans into a lorry. In both cases herniating fatty nodules with evidence of haemorrhage were removed, with resultant cure.

Oedema is likely to arise in postural cases, and congestion may follow in febrile illnesses, which so often light up "fibrositis" in the back. An example of this type of case was furnished by a patient who developed acute fibrositis during an attack of infective hepatitis: at biopsy a large non-pedunculated herniating fatty lobule under considerable tension was excised with complete relief of symptoms. Many of the fatty lobules taken from other cases had fibrous pedicles, the pedicle often running from one fatty lobule to another. Sections of fatty lobules frequently showed young fibrous tissue growing into the adipose tissue; this, over a period of years, might lead to the formation of a pedicle. Once a pedicle has formed it is easy to visualize torsion of that pedicle taking place. The causes of pain and swelling in these herniae and fatty lobules which become painful nodules may,

therefore, be (1) oedema, (2) haemorrhage, (3) congestion, (4) torsion of pedicle.

Case Reports

Four case reports of the many which were seen and had biopsy performed are included, as they illustrate herniation and pedicle formation, and the part played by mechanical and postural conditions in the aetiology of fibrositis of the back.

Case 1.—This patient gave a history of lumbago in 1942. He was in bed for 11 days and was discharged no better. Light duty worked off the pain in three or four weeks. The present attack started 16 days before admission. He had recently been driving a very stiff lorry which was difficult to start and in which there was a lot of vibration. On examination he had a very tender spot at the outer edge of M. Sacropinalis (R) at the level of the third lumbar vertebra. Slight thickening could be felt but no nodule could be palpated. At biopsy an incision was made over the tender spot and a finger introduced into the wound. No nodule could be felt but pressure reproduced the pain. When the deeper layers of the superficial fascia were exposed a small herniation, which felt tense and nodular, was seen to protrude throught it. This herniating fat was removed with a small area of fascia. After 14 days the patient was completely cured and discharged free from pain. Microscopical examination of a section showed fatty tissue with young very cellular fibrous tissue growing into it. The blood vessels were congested and there was some haemorrhage into the tissue. There were also areas of older fibrous tissue, probably the result of earlier inflammation or of trauma; and serous exudate into some of the fat spaces.

Case 2.—This patient had a history of intermittent pain in the back for fifteen years following an accident when playing football. The pain was lit up by damp weather, cold winds, attacks of influenza, etc. A tender spot over the crest of the right ilium could be palpated and local pressure reproduced the pain. An incision was made over the tender spot and a fat lobule found lying superficial to the gluteal fascia. This lobule had a vascular pedicle going through the fascia to another larger lobule lying deep to the fascia, among but distinct from the surrounding fat. Pressure on this evoked the pain. This tissue was removed and a complete cure resulted—a freedom from pain hitherto unknown. The section taken from this tissue consisted of fatty material invaded by young and very cellular fibrous tissue. There were many patches of older fibrous tissue similar to those in the section from Case 1, but they were much more numerous. The nodule was relatively avascular, such nodules as were present being small and not congested.

Case 3.—This patient had a history of pain in the back of four years' duration, first noticed after sleeping on damp ground. The pain was in the left side of the back, radiating to the buttock, the back of the thigh, knee, and calf, and tended to recur with chills, etc. Rest in bed in hospital had given no relief. On examination there was an easily palpable nodule at the outer border of the Erector Spinae just above the level of the iliac crest, and pressure on this point reproduced the pain. On incision a tense nodule of fat the size of a cherry was found lying in the superficial fascia; it had a vascular pedicle which ran through the superficial fascia. The result of removal was complete freedom from pain.

Case 4.—This patient had a history of severe pain in the left buttock and down the back of the thigh for a year. The original cause was not known; there was no history of trauma or infection. The pain became worse when for any reason he had to lie in bed, and on this occasion flared up during an attack of infective hepatitis. On examination a tender nodule was found in the buttock 5 inches from the midline and 2½ inches below the iliac crest. An injection of 10 c.cm. of 1 per cent. novocain saline and teasing with a thick needle gave much relief, but the tender nodule was still present. An incision was made over the nodule and the fat in the superficial fascia was found to be in two or three layers, which were incised. Some lobules seemed to be under tension, bulging up into the wound when the septa were cut. One nodule the size of a pea was removed and the remainder teased and broken up; it appeared to be a non-pedunculated fat hernia. The patient was discharged 18 days later free from pain.

Conclusions

The constant occurrence of the basic-fat pattern in all the backs dissected, even in those which were very wasted and had little or no subcutaneous fat, suggests that the fatty tissues may play an important part in the pathology of "fibrositis" of the back. This supposition is further confirmed by the fact that in every case submitted to biopsy fatty tissue was removed with complete relief of symptoms.

The mechanism of herniation and the subsequent causation of symptoms may be classified as follows: A. Herniae of fat may be (1) Congenital; and (2) Acquired: (*a*) mechanical, (*b*) postural. B. The causation of signs and symptoms from the hernia may be due to (1) Oedema, (2) Haemorrhage, (3) Congestion, (4) Torsion of Pedicle.

Summary

A composite description of the dissection of twelve backs is given with particular reference to the "basic" fat pattern and the occurrence of fatty herniations, particularly in this fat pattern. Four cases illustrating the possible aetiology and pathology of fibrositis of the back are recorded.

Reference

Copeman, W. S. C., and Ackerman, W. L. *Quart. J. Med.*, July, 1944.

SOME ORTHOPAEDIC ASPECTS OF RHEUMATIC DISEASE

BY

A. G. TIMBRELL FISHER

The rheumatic diseases, including the rheumatoid and osteo-arthritic types of arthritis and non-articular rheumatism, constitute by far the most important cause of crippling. A person suffering from a serious cardiac lesion is also in a sense crippled, so that, if we include the incapacity for work from this condition due to acute rheumatism, the problem is seen to be one of grave national and indeed international importance. In England and Wales alone, the economic loss is at least £20,000,000 annually, while, according to the official publications of the Department of Health for Scotland, 14% of the total invalidity of persons insured under the National Health Insurance Act north of the Tweed is due to rheumatism, and the annual economic loss to Scotland is estimated at £3,000,000. Although these figures have been frequently quoted, it seems that constant reiteration is necessary to awaken the national conscience.

Early Prevention of Deformity

In every case of rheumatic disease, and particularly in the more acute forms, it is absolutely essential that the prevention of deformity by suitable orthopaedic measures must be borne in mind from the first day of onset of the disease. This statement may be considered platitudinous, but it is surprising how often, even at the present day, this important principle is neglected.

Orthopaedic treatment is (or should be) based upon principles that are clear and definite, and, provided these principles are borne in mind from the very commencement of the disease, deformity may be either entirely prevented or reduced to a minimum. It is doubtful whether these orthopaedic principles would be greatly altered even if the cause or causes of rheumatic disease were definitely established; although it is to be hoped that many more cases would be cured before serious deformity had occurred. This point requires mention, because it is sometimes argued that the formation of an adequate number of treatment centres for rheumatic patients, where modern methods of medical treatment, physiotherapy, orthopaedics, etc., can be made available, would be of no use while we remain ignorant of precise aetiological factors. Every facility should be granted for such research and the need for this is urgent, but this should not be made an argument for deferring the urgently needed treatment centres.

Although the situation has improved in recent years, experience teaches that in Britain we have lagged behind some other countries in recognizing the supreme importance of the orthopaedic aspects of rheumatism from zero hour of the onset of rheumatism, particularly as it affects the joints; real team work has often been conspicuous by its absence. In arthritic units in some other countries there is much closer liaison between the physician and the orthopaedic specialist. In some, every case is seen by the orthopaedist as a matter of routine, and, in the early cases, the methods to be used in combating the onset of deformity are discussed with the physician and other members of the team. British orthopaedic specialists have been in the forefront in the prevention and treatment of deformity in rheumatic disease, and there have been important advances in recent years. Yet it is depressing to see the great numbers of patients with advanced crippling and deformity that report at the few clinics and hospitals in this country that specialize in rheumatic disease. Orthopaedic specialists could do infinitely more for patients if they could see them earlier; in the majority, the most favourable time for treatment would have been months or even years earlier.

Illustrative Case

My advice was sought recently by a medical colleague with regard to the orthopaedic treatment of a young man aged 25 years suffering from the rheumatoid type of arthritis and with gross deformities. In 1940 he developed thyrotoxicosis, and, after prolonged medical treatment, thyroidectomy was performed at a London hospital. Within a month of the operation he developed a generalized rheumatoid type of arthritis. He was subsequently transferred to another hospital, where, apparently, the gross deformities occurred. After a spell at a spa, where he was given a course of myocrysin and various methods of physical treatment, he was transferred to the L.C.C. Rheumatism Unit in London. There were gross flexion deformities of hips and knees and the feet were fixed in a position of equino-varus. In addition there were typical deformities of the elbows, wrists and fingers.

Careful examination under anaesthesia revealed that the ankylosis of the joints of the lower extremities was

of a firm fibrous nature, and it was not possible appreciably to improve the deformed positions. The orthopaedic treatment of such a case bristles with difficulties. The failure to prevent the occurrence of these deformities may well involve a series of major operations upon the knees and ankles, spread over years rather than months, and, provided the patient's mental stamina and courage are adequate, it may eventually be possible to enable him to stand or even walk a little. Why are such sad cases so frequently seen in modern times or, as King Edward VII once said of tuberculosis: "If preventable why not prevented?"

A weak point in the present system is that cases of arthritis applying for treatment at hospitals and clinics are often automatically referred to the physicians irrespective of the stage of the disease, and some time may elapse before orthopaedic opinion is sought, if indeed at all. During this long period the patients often run through the whole gamut of medical treatment, which, in the prevailing absence of knowledge of causation, is often admittedly empirical, and the orthopaedic treatment which these patients so urgently need is withheld. The percentage of cases that reach the orthopaedic specialist only in the advanced stages I should put at the surprisingly high figure of between 75 and 90. Then there is the deplorable absence of facilities for the adequate investigation and modern treatment of rheumatic disease and lack of research into the causation. The Empire Rheumatism Council under its chairman, Lord Horder, has in recent years endeavoured to draw public attention to this reproach to British Medicine and to overcome the apathy of the Ministry of Health towards this problem. It has been proved up to the hilt that it is impossible to cope with this matter by relying upon the generosity of the public alone. State help is absolutely essential, and it is of vital importance that this should be forthcoming.

Some Defects and their Remedies

Another reason for the great number of advanced cases of deformity seen is that, in the absence of suitable centres and clinics for rheumatic patients, the treatment falls to the lot of general practitioners who have had no proper training or experience in this group of diseases but who do their best under very difficult conditions. They are often unable to get the early acute cases of the rheumatoid type of arthritis into hospital, and it is frequently impossible for them to obtain treatment for the more chronic deforming cases of rheumatism at a hospital, spa, or clinic with modern facilities. The treatment of such chronic cases is often spread over long periods, and with the present acute shortage of beds the hospital authorities look with disfavour upon such long-term cases. The general practitioner is thus compelled to rely largely upon his own efforts. The important point requires emphasis that practitioners almost invariably assert that, during their period of training, instruction in rheumatic diseases has been inadequate or entirely lacking.

The remedies appear therefore to be:

(*a*) Much closer cooperation between physicians and orthopaedic surgeons with the realization that the orthopaedic aspects of rheumatic diseases are of never less than equal importance to the medical aspects and often greatly exceed the latter in importance.

(*b*) The provision of adequate facilities for modern treatment and research into causation of rheumatic diseases, for which financial support by the State is indispensable.

(*c*) Instruction in rheumatic diseases in the training of the future practitioner at the teaching hospitals, and post-graduate courses in this subject for those whose student days are over.

One of the most encouraging factors in the situation, and one which should play a very important part in the campaign against the crippling deformities of rheumatic disease, was an agreement that was arrived at in 1942 between the Empire Rheumatism Council and the British Orthopaedic Association. A common policy was decided upon as follows.

"The Empire Rheumatism Council and the British Orthopaedic Association are in cordial agreement that their mutual cooperation in the diagnosis, prevention, and treatment of crippling conditions will be of the greatest service to the health of the community. Both bodies aim at close liaison between the physician specializing in rheumatism and the orthopaedic surgeon, seeking to enlist the sympathetic cooperation of the general practitioner, the public health services, and social workers generally. Orthopaedic hospitals and orthopaedic departments of general hospitals should include on their staffs a physician with special knowledge of the rheumatic diseases. Rheumatism centres should include on their staffs an orthopaedic surgeon. Since the application of methods of physical therapy and of occupational therapy for orthopaedic and rheumatic patients is largely identical, a combined outpatient clinic should, wherever practicable, serve for both classes of patients. In such combined centres, the orthopaedic cases will be under a team headed by an orthopaedic surgeon; for rheumatic cases, the team will be headed by a physician.

"In view of the growing appreciation of the regionalization of medical services the scheme for rheumatism treatment centres should be planned to fit into such schemes as may be arranged for the future. This has, in fact, already been done in orthopaedic schemes. As in orthopaedic work, the development of successful centres has been based upon the legal requirements of the notifications of certain crippling diseases and upon the public responsibility for the provision and payment for their treatment, so in rheumatic disease a similar degree of responsibility should be assumed by the State or local authority.

"Adequate provision for the training of young physicians and surgeons in research, diagnosis, and treatment should be associated with suitable encouragement to make the study of rheumatic disease a life work."

To put into effect the agreed plan of cooperation, a joint standing advisory committee has been con-

stituted. Thus, amidst the strains and stresses of the most devastating war that this world has ever experienced, and while this country was undergoing intensive bombing, what may prove to be one of the most valuable and far-sighted cooperative efforts in the history of medicine was achieved.

Early Prevention and Treatment of Deformity

Although the problem of prevention and treatment of deformities in the earlier or more acute stages of rheumatic forms of arthritis comes within the domain of the orthopaedic specialist, and in the modern rheumatism centre his advice is often sought in difficult cases, the prevention of deformity is in practice mainly the concern of the physician. It is obviously impracticable for the orthopaedic specialist to see and advise upon every case in a large centre. It is most important, therefore, that physicians at such centres should have a thorough knowledge of the principles of prevention of deformity, and be versed in plaster technique, in methods of extension, and in the optimum positions for joints mentioned below. A good working knowledge of the principles of physiotherapy in rheumatic diseases is essential.

Pain associated with muscular spasm is a prominent feature in early acute cases. Usually the more powerful flexors overcome their opponents, so that flexion deformities must be guarded against, and, in such joints as the hip and shoulder, abduction, adduction or rotation are superadded. In such early cases every effort must be made by rest to the affected joints in the optimum positions to inhibit muscular spasm. Our ultimate aim is, however, to preserve a useful range of movement in the joint, so that great care must be taken to commence gentle movements of the joint as soon as the general and local conditions permit. Prolonged rest causes the joints to become fixed owing to shortening of the joint capsule and peri-articular structures on the side of maximum contracture, or, if deformity has been avoided, in the optimum position. Although this is a lesser evil, ankylosis should not be too readily decided upon, although it may be inevitable in the ultra-acute cases. In these acute cases a period of rest in bed is advisable, particularly in the case of the joints of the lower extremity, and by far the most satisfactory method of applying rest to the affected joint is by means of moulded plaster-of-Paris splints. For joints such as the ankle, knee, wrist, and elbow, and in cases of spondylitis, this method, when the necessary experience has been gained, is of the greatest value and far more comfortable and efficient than the usual types of padded splint of wood or metal. In arthritis cases the plaster should be separated from the skin by a layer of stockinet; a completely skin-tight plaster is inadvisable, and in every case the plaster is bivalved either immediately or within a few hours of application. This avoids the possibility of undue constriction and also permits the removal of the upper segment of the plaster case, or, in some cases, both segments for access to the joint or limb for any local treatment if this is considered desirable. In the less acute cases a little gentle active or assisted movement is possible and the splint is then reapplied.

A somewhat similar method can be employed when muscular spasm has already brought about early deformity. For instance, if flexion of the knee has occurred a plaster-of-Paris splint is applied to the joint without making any attempt to correct the malalignment by manipulation. A preliminary injection of omnopon or a small dose of intravenous pentothal often has a good effect in lessening muscle spasm, so that the plaster case can be applied in a better position. The case is bivalved, as before. After about a week it will usually be found on removing the plaster that spasm has so far subsided that a fresh plaster case can be applied in an improved position, and the process is repeated until the joint regains the optimum position. In patients suffering from spondylitis ankylopoietica, a plaster bed is a valuable and comfortable way of applying rest and of preventing deformity.

Space will not permit mention of the use of weight extension to correct deformity in acute cases. It is sometimes of value, particularly in the hip, but it is difficult to apply and requires constant supervision by a nursing staff with special knowledge of the methods. In my own practice, I have largely abandoned the method, except in the case of the hip-joint, in favour of the plaster technique described above.

In recumbent patients, every effort must be made to prevent faulty posture in bed. If the patient is propped up with pillows kyphosis is apt to develop, and loss of the normal lumbar curve. Fixation of the hips and knees in flexion is often due to the bad practice of allowing the knees to lie flexed over a pillow, and pressure of the bed-clothes not infrequently brings about a flexed and valgoid position of the feet and ankles.

Orthopaedic and Surgical Treatment in the later stages

It is impossible to review adequately and within the scope of a short paper this large and important subject. It is proposed, therefore, in this section merely to make some general observations about a few special aspects of the subject which the author feels have not received the attention that they merit and which he has personally found of great value. This is a very large subject, and, to avoid repetition of much that is already common knowledge, it is possible to deal with only a few special points, some of which are questions of policy. It is probable that in the near future the number of centres and clinics for the treatment of rheumatic patients will be increased, and, to avoid confusion and overlapping of work, it should be made clear that when deformities have occurred, and particularly when those originally due to muscular spasm have become fixed by adhesions or scar-tissue, treatment by the orthopaedic surgeon is indicated.

Treatment by Manipulation

Careful manipulation under anaesthesia in slight or moderate cases of contraction of joints, when the acuter symptoms have subsided, is of the utmost value in selected cases, especially if performed in stages between which the limb is temporarily fixed in the corrected position in plaster. Manipulative treatment is highly specialized work and is dangerous in inexperienced hands. This difficult and highly technical work lies within the province of the orthopaedic surgeon.

Prevention of deformity is one of the most important of the routine duties of the physician at the rheumatic centre and of his medical assistants, aided in difficult cases by the orthopaedic surgeon. The physicians are, or should be, thoroughly conversant with the practical side of deformity prevention, but the treatment by manipulation or other measures when any deformity has actually occurred should be undertaken by the orthopaedic surgeon. An important fact concerning the treatment by manipulation of crippling rheumatic conditions is that the orthopaedic surgeon experienced in this branch finds that he is able to remedy by these measures many conditions for which a major surgical operation was formerly the only solution. Also, by proceeding in careful stages and doing a little at a time, much can often be done for the patient with advanced deformities.

It is often forgotten that a certain amount of natural repair takes place in chronic osteo-arthritic joints and in the later stages of the rheumatoid type. When the articular cartilage has been destroyed the underlying bone becomes sclerotic and highly polished. This can take place only when movement has been maintained. By restoring a fuller range of movement to the stiffened rheumatic joint by manipulation we assist the natural powers of repair. Personal experience of cases of established arthritis of the hip bears out this statement. Before performing arthrodesis or some other major operation upon the painful arthritic hip, a fair trial should always be made of routine medical and physical treatment and of careful manipulation. Arthrodesis is reserved for those patients who resist such measures and whose general condition is suitable for such a severe operation. The number of operations of arthrodesis of the hip performed by the author in the last 20 years has in this way steadily diminished. Space will not permit a mention of some of the other drawbacks and dangers of arthrodesis, except the fact that the onset of arthritis in the non-operated hip, which not infrequently happens, is very serious, as the patient may be left with two ankylosed hips.

It is important to realize that the treatment after manipulation is of great importance. Indeed, in many cases the manipulation should be regarded as merely the first step in a campaign of treatment which may be protracted, and in which patience and perseverance are required by the patient and by all concerned. Disappointment is inevitable if this fact is not recognized and if the patient is unable or unwilling to cooperate. Re-education of muscles and of function by means of exercise in the Guthrie-Smith suspension apparatus is of the greatest value after manipulation.

Arthrotomy and Lavage: Synovectomy

An operation that the author has proved highly satisfactory is that of arthrotomy and lavage. It is particularly indicated in obstinate cases of pain and effusion in arthritis of the rheumatoid type affecting the knee-joint. At operation one often finds the joint to be full of thick masses of fibrinoid or necrotic material. The reason for the failure or only partial success following attempts to aspirate such joints is obvious, as the necrotic material cannot pass through the aspirating needle. Often a small incision suffices for the evacuation of the necrotic masses, and the joint is irrigated thoroughly with Dakin's solution or with some other non-irritating antiseptic solution such as an isotonic solution of flavine. Where necessary, the incision can be extended to deal with hypertrophied synovial fringes, loose bodies, etc., or converted into the author's patella-displacing operation if synovectomy, complete or partial, is deemed necessary.

The operation, even in its simplest form of evacuation of the necrotic material with lavage of the joint, may play an important part in preventing deformity, as the fibrinoid material, if allowed to remain, is converted into intra-articular adhesions. It is interesting to note also that pain and spasm are usually markedly alleviated, and an obstinately raised sedimentation rate may fall rapidly after operation. Among the author's cases is one of early rheumatoid type of arthritis of the knee associated with intermittent effusion showing periodicity. Partial synovectomy by this method was performed by the author through the patella-displacing approach 21 years ago and the joint irrigated with normal saline. A letter received three months ago stated that the patient had remained symptom-free since the operation.

Operation for Painful Osteo-arthritic Joints

Another type of operation that has been found of considerable value in chronic, mainly monarticular, forms of osteo-arthritis, particularly when involving the knee-joint, is a combination of cheilotomy with lavage and manipulation when limitation of movement by adhesions is also present. It is not a big operation and elderly patients stand it quite well (*ceteris paribus*). In many cases of osteo-arthritis of the knee-joint which remain painful in spite of prolonged physical treatment, the cause of the symptoms is in reality some form of internal derangement (*a*) by hypertrophied synovial fringes or pads or osteophytes, either loose or attached, at the periphery of the joint, in the intercondylar region, or elsewhere; (*b*) by detached fragments of the articular cartilage or necrotic debris; and (*c*) fibrinous degeneration and hypermobility of one or other semilunar cartilage, which, owing to alterations of alignment of the joint surfaces, may cause symptoms of internal

derangement. In some cases an old lesion of the semilunar cartilage due to trauma may be present and may have been the starting-point of the arthritis.

The osteo-arthritic knee of long standing which fails to respond to physical or other treatment is a feature of nearly every out-patient department, and in selected cases surgery can often do much for these patients. Intravenous pentothal, followed if necessary by gas and oxygen, is the anaesthetic of choice, and a tourniquet is used to create a bloodless field of operation. The knee is flexed over the end of the operating table. The knee-joint is usually approached by a vertical incision upon the antero-internal aspect of the joint between the patella and its ligament and the internal lateral ligament. Sometimes the signs and symptoms or the x-ray film indicate a similar type of incision upon the outer side of the joint; or both may be necessary. Any prominent osteophytes are chiselled away with a curved chisel from the articular margins, the inter-condylar space, and the anterior tibial plateau. The state of the semilunar cartilages and of the infra-patellar pad of fat is ascertained and any hypertrophied fringes or loose bodies are removed. The joint is then thoroughly irrigated with Dakin's solution to wash out necrotic debris and any loose bodies that have escaped detection. If movement was limited, the joint is carefully manipulated, and sometimes it is possible to see and divide with the scalpel tight bands of intra-articular adhesions. The joint is closed without drainage.

In the after-treatment the patient is encouraged to flex and extend the knee a few degrees and to contract the quadriceps from the day after the operation, and for several weeks no effort is spared to restore the wasted muscles and consolidate any increased range of movement obtained by an intensive course of re-educational exercises. In this connection exercises in suspension slings upon the Guthrie-Smith apparatus have proved to be of great benefit. The author has had twenty-five years' experience of this type of operation and can vouch for its great value in the majority of cases.

Summary and Conclusions

Far too many cases of crippling deformity in rheumatic disease occur even in modern times.

Such crippling involves much personal suffering and economic loss to the Nation and is largely preventable.

Reasons for this state of affairs are put forward which include: (*a*) lack of team work and of precise definition of the respective duties of the physician and orthopaedic surgeon with regard to the prevention and treatment of deformity; (*b*) ignorance, through no fault of his own, of the whole subject by the average general practitioner who sees the cases in the early and often critical phases; (*c*) acute lack of hospital and clinic facilities for sufferers from rheumatism; (*d*) prevailing ignorance concerning the causation of rheumatism.

Some suggestions are offered as to how these conditions might be rectified, many of which have been urged by others and of recent years by the Empire Rheumatism Council.

A short description is given of the principles of prevention of deformity and of its treatment in the earlier and more acute stages.

Lastly a short account is given of some lesser known but valuable methods of orthopaedic and surgical treatment suitable for the more chronic stages of rheumatic disease.

RHEUMATIC FEVER IN MALTA:

A CLINICAL NOTE

BY

R. E. TUNBRIDGE and W. S. C. COPEMAN

Preliminary inquiries made by the Empire Rheumatism Council before the outbreak of the present war had indicated that rheumatism was not a serious problem in Malta. Undulant fever, on the other hand, was prevalent. The latter disease, although clinically similar to rheumatic fever during the acute stages, is not causative of cardiac lesions. It is, however, followed by a long period of debility during which the resistance of the patient to other infections appears to be lowered.

Cardiac Lesions among Recruits

One of us, while for a period Chairman of the Medical Recruiting Board, was impressed by the number of candidates rejected with established cardiac lesions. Ninety out of the first 15,000 conscripts medically examined were rejected on account of endocarditis, and approximately a further 30 were subsequently discharged from the army with a similar diagnosis. The case incidence of proved endocarditis was thus approximately 8 per 1,000 among the Maltese male recruits aged 17½ to 38 years. Of 90 cases rejected by the Medical Recruiting Board 20 had an aortic and a mitral lesion, 69 a mitral lesion, and 1 an aortic lesion.

ASSOCIATION OF UNDULANT FEVER WITH RHEUMATIC FEVER

A careful analysis of the history of the above cases revealed that an undiagnosed rheumatic infection might in many instances have followed upon a recorded attack of undulant fever. A positive serological diagnosis of undulant fever had been obtained in 23 cases, and of these all but 2 gave a suggestive history of acute rheumatic fever subsequently. A further 13 cases gave a history of a clinical attack of undulant fever followed by repeated attacks of joint paints. It is of course possible that the latter, which were not confirmed serologically as undulant fever, were in fact cases of rheumatic fever.

Serological confirmation of the diagnosis of undulant fever is the usual practice for hospital cases in Malta, but in the non-hospital cases, the diagnosis may be made on clinical grounds alone, and a patient's statement that he has suffered from undulant fever cannot necessarily be accepted as evidence of his having had the infection, as there is a tendency for the laity to call any prolonged febrile illness undulant fever. Until reliable confirmation as to the frequency and degree of the anamnestic reaction for melitensis in the Maltese is available, the differential diagnosis in Malta between rheumatic fever and a relapse of undulant fever cannot be made with certainty.

Two brief case notes of recruits diagnosed by the Medical Recruiting Board as having mitral stenosis illustrate the possible association between undulant and rheumatic fever.

Case A.—Aged 18 when seen by Medical Board and established mitral stenosis diagnosed. At 14 suffered from an attack of undulant fever, proved serologically in hospital. Two years later at the age of 16 further attack of fever; since when he has had periodical attacks of joint pains.

Case B.—Aged 20 when seen by Medical Board and established mitral stenosis diagnosed. History of undulant fever confirmed serologically at age of 10. Eighteen months later had an acute attack of fever believed at the time to have been a relapse of the undulant fever but which responded to salicylates. Since then has always been liable to attacks of joint pains characterized by their flitting from joint to joint but never sufficiently severe to confine him to bed.

A study of the histories of a small series of children selected subsequent to the recent siege provided further evidence that undulant fever may predispose to and/or accelerate a secondary rheumatic infection. The following 2 cases were selected from among 10 similar cases seen at the outpatient department of the Central Hospital through the courtesy of Prof. J. J. Debono.

Case C.—Aged 8. Rather fair-haired, well-nourished child who for the last four months complained of dyspnoea, and after playing with other children for a few minutes would return home and lie down, giving no reason for this.

The child's history during the siege was as follows: During first months frightened during raids, but not unduly so, and after that did not seem to mind them much. Family was living in a rock tunnel in the higher part of the town. This was well above the sea level and fairly dry, and was shared with several other families. During the third month two of the children of the other families went sick and were diagnosed as having undulant fever; the normal "rheumatic" pains occurred in the third week. A week or so later the patient also developed undulant fever, which was clinically typical (Debono), and

gave a positive blood serum reaction. On the twenty-fourth day pain settled in the left hip-joint and soon became very severe, keeping her awake for several nights; it did not respond to aspirin, and morphine had to be used. After ten days this pain transferred to both knees in rapid succession, and also affected the neck for a few days. She was treated with "brucelline," which appeared to have a good effect, and at the end of six weeks from the onset she complained of no further pain, but seemed still very weak and "quiet." A week later the pains recurred—a rather unusual event in undulant fever—but this time in both knee-joints and the right wrist, all these joints suddenly becoming reddened and swollen, unlike the previous attacks. She developed T.104° F. and seemed very ill. Brucelline was again tried with no effect on the temperature or pain, and was not persisted with as the pains now responded to aspirin. The pain, after remaining in these sites for four days, began to flit from these to other joints every few days in a manner which in retrospect seems typical of rheumatic fever. The child was ill for a further six weeks, and then gradually recovered.

At the time of examination one year later a well developed condition of mitral stenosis was present. Records of the previous illness showed that no cardiac lesion had then been present.

One of the other children who had developed undulant fever in this cave was traced, and her subsequent history as given by the mother was very similar although less severe :

Case D.—Aged 10. The mother complained that the child had never fully recovered after a first attack which was proved to be undulant fever, eighteen months previously, and frequently suffered with pains in various parts of the body, chiefly the knees, which made her cry, but never lasted long. On examination the child was thin and pale and obviously "highly strung." The heart appeared to be enlarged, and this was confirmed on radiographic examination. There were pre-systolic and systolic murmours heard at the apex.

INFLUENCE OF SIEGE CONDITIONS

With the children the possibility of siege conditions having been a predisposing factor must also be considered. During the period 1941–43 continual aerial attacks increased the overcrowding on the island. The population of the towns and villages neighbouring upon the harbour and upon the aerodromes were compelled to live in shelters hewn out of the soft limestone rock. The rock had many faults and dampness was a feature of many shelters. The dietary of the poorer section of the population was reduced to the minimum consistent with life—approximately 1,500 calories. Avitaminosis was observed in the civilian population—mainly deficiencies due to lack of the vitamin B complex. Vitamin A was also lacking, but no increase in disease attributable to this was reported. Vitamin C alone remained in moderate supply since fruit and green vegetables are the common produce of the island. This is of interest in view of the considerable literature which has centred around the supposed association of vitamin C shortage and the prevalence of acute fevers, including rheumatic fever (Rinehart, 1943).

The abnormal conditions of the siege prevented the Government from fulfilling their plans to pasteurise the milk supply of the island, so that undulant fever, always common in Malta, has increased in severity and frequency during the war years. Prof. Debono (1945) has also observed an increased incidence of juvenile rheumatism. In view of the suggested association of the two diseases there appears to us to be a problem not only of clinical but also of colonial importance awaiting fuller investigation.

Summary

Evidence is submitted to show that rheumatic fever is not so rare in Malta as is believed. Medical examination of recruits aged 17½ to 38 years revealed a case incidence of 8 per 1,000 with rheumatic endocarditis.

It is considered that the presence of rheumatic fever may have been overlooked in many cases in the past owing to the prevalence of undulant fever, the clinical course of which may resemble that of rheumatic fever.

Examination of the clinical histories of cases with established rheumatic endocarditis yielded suggestive evidence that undulant fever may predispose a patient to a subsequent attack of rheumatic fever.

The recent siege conditions and the increased prevalence of undulant and rheumatic fever among the juvenile population affords clinical and administrative problems worthy of further investigation.

Our thanks are due to the D.D.M.S. Malta for the helpful co-operation which he extended to both the authors of this paper during their respective periods as Advisor in Medicine to the Command.

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